

mikromedia™
for PIC32®

Compact development system rich with on-board peripherals for all-round multimedia development on PIC32MX460F512L device.

MikroElektronika
DEVELOPMENT TOOLS | COMPILERS | BOOKS

TO OUR VALUED CUSTOMERS

I want to express my thanks to you for being interested in our products and for having confidence in MikroElektronika.

The primary aim of our company is to design and produce high quality electronic products and to constantly improve the performance thereof in order to better suit your needs.



Nebojsa Matic

General Manager

Table of contents

Introduction to mikromedia for PIC32®

The **mikromedia for PIC32®** is a compact development system with lots of on-board peripherals which allow development of devices with multimedia contents. The central part of the system is a 32-bit **PIC32MX460F512L** microcontroller. The mikromedia for PIC32® features integrated modules such as stereo MP3 codec, **TFT 320x240 touch screen** display, accelerometer, USB connector, audio connector, MMC/SD card slot, 8 Mbit flash memory, 2x26 connection pads and other. It comes pre-programmed with USB HID bootloader, but can also be programmed with external programmers, such as mikroProg™ or ICD2/3. Mikromedia is compact and slim, and perfectly fits in the palm of the hand, which makes it convenient platform for mobile devices.





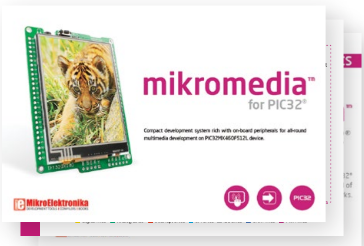
Package contains



01 Damage resistant protective box



02 mikromedia for dsPIC33® development system



03 User's guide, schematic and pinout

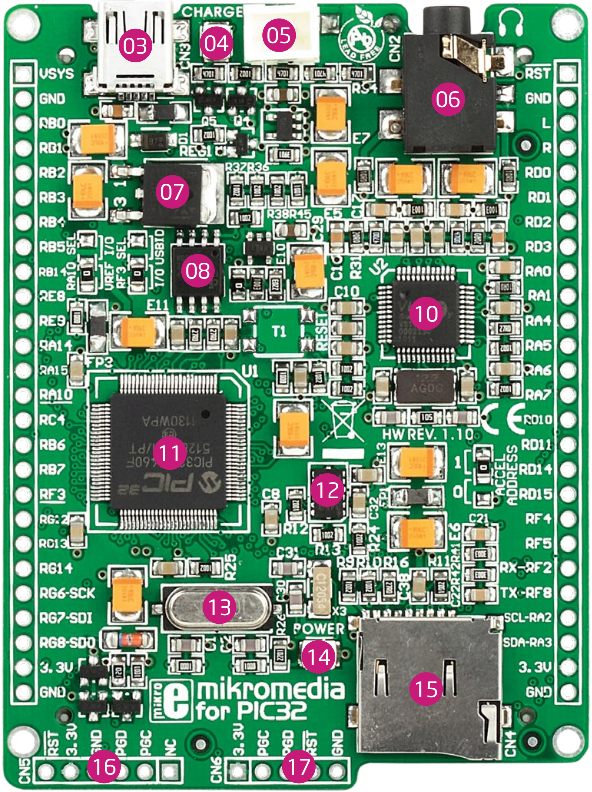


04 USB cable, two 1x26, one 1x6 and one 1x5 male headers

Key features

01 Connection Pads
02 TFT 320x240 display
03 USB MINI-B connector
04 CHARGE indication LED
05 LI-Polymer battery connector
06 3.5mm headphone connector
07 Power supply regulator
08 Serial Flash memory
09 RESET button
10 VS1053 Stereo mp3 coder/decoder
11 PIC32MX460F512L microcontroller
12 Accelerometer
13 Crystal oscillator
14 Power indication LED
15 microSD Card Slot
16 ICD2/3 connector
17 mikroProg connector





System specification

power supply
Via USB cable (5V DC)

power consumption
58 mA with erased MCU (when on-board modules are inactive)

board dimensions
81.2 x 60.5 mm (3.19 x 2.38 inch)

weight
~50g (0.11lbs)

class B product
Product complies with the Class B limit of EN 55022 and can be used in the domestic, residential, commercial and industrial environments.

CAUTION: Electrostatic Sensitive Device
Permanent damage may occur on devices subjected to high energy electrostatic discharges which readily accumulate on the human body or test equipment and can discharge without detection.

1. Power supply

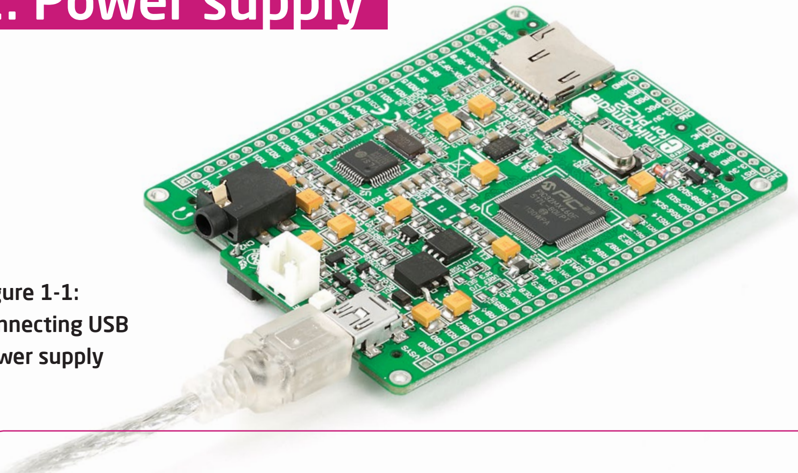


Figure 1-1: Connecting USB power supply

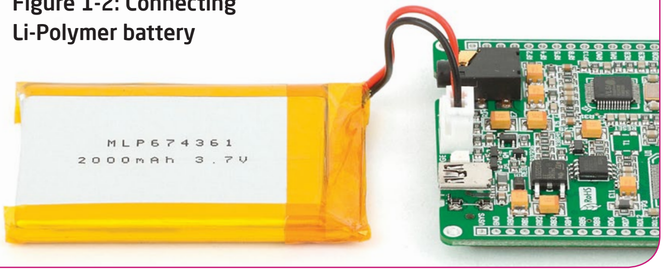
USB power supply

You can apply power supply to the board using **MINI-B USB** cable provided with the board. On-board voltage regulators provide the appropriate voltage levels to each component on the board. **Power LED (GREEN)** will indicate the presence of power supply.

Battery power supply

You can also power the board using **Li-Polymer** battery, via on-board battery connector. On-board battery charger circuit **MCP73832** enables you to charge the battery over USB connection. **LED diode (RED)** will indicate when battery is charging. Charging current is ~250mA and charging voltage is 4.2V DC.

Figure 1-2: Connecting Li-Polymer battery



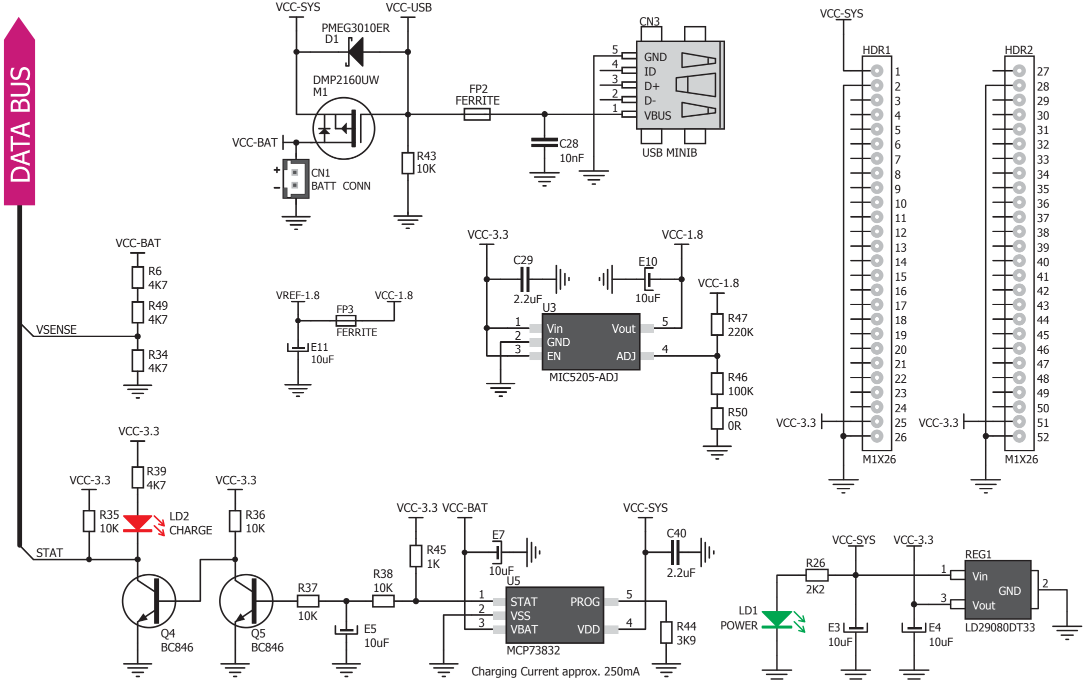
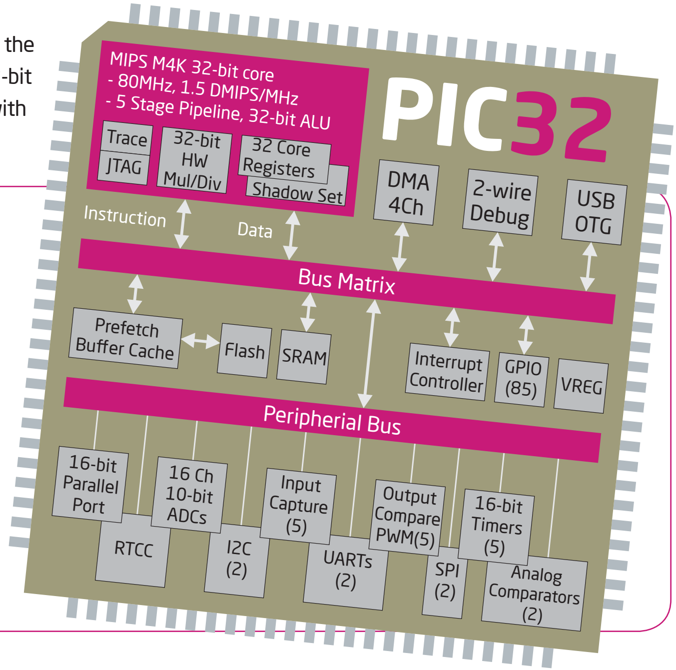


Figure 1-3: Power supply schematics

2. PIC32MX460F512L microcontroller

The **mikromedia for PIC32®** development system comes with the **PIC32MX460F512L** microcontroller. This high-performance 32-bit microcontroller with its integrated modules and in combination with other on-board modules is ideal for multimedia applications.



Key microcontroller features

- 1.56 DMIPS/MHz, 32-bit MIPS M4K Core;
- 512K Flash (plus 12K boot Flash);
- 32K RAM (can execute from RAM);
- 85 I/O pins;
- SPI, I^2C, A/D;
- 16-bit, 32-bit Digital Timers;
- Internal Oscillator 8MHz, 32kHz;
- RTCC; etc.

3. Programming the microcontroller

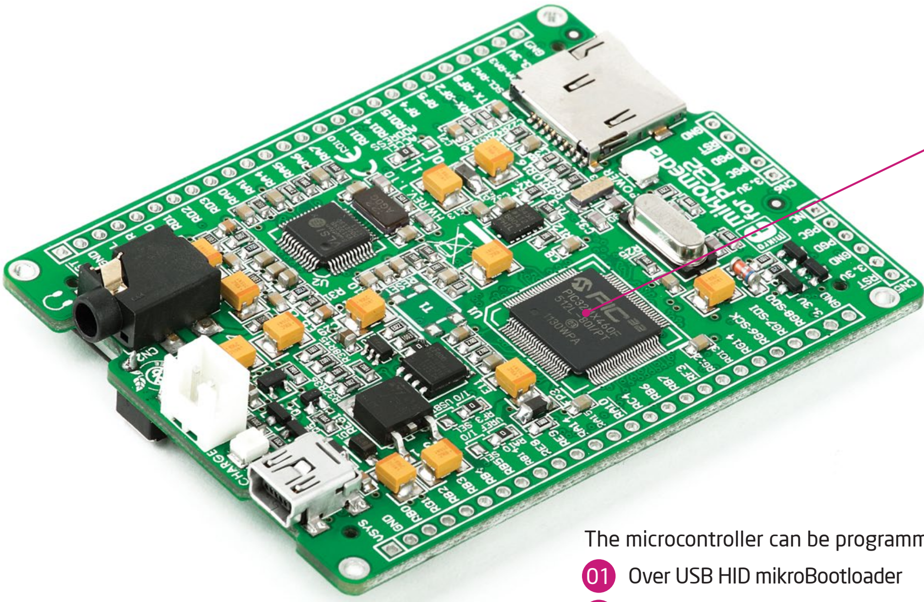




Figure 3-1: PIC32MX460F512L microcontroller

The microcontroller can be programmed in three ways:

01 Over USB HID mikroBootloader

02 Using mikroProg™ external programmer

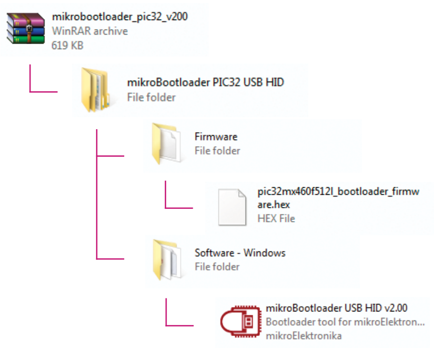
03 Using ICD2/3 external programmer

Programming with mikroBootloader

You can program the microcontroller with bootloader which is preprogrammed into the device by default. To transfer .hex file from a PC to MCU you need bootloader software **(mikroBootloader USB HID)** which can be downloaded from:

www.mikroe.com/downloads/get/2153/mikrobootloader_usb_hid_STM32F407VGT6.zip

Upon download, unzip it to desired location and start the mikroBootloader application:



step 1 – Connecting mikromedia



Figure 3-2: USB HID mikroBootloader window

01 To start, connect the USB cable, or if already connected press the **Reset** button on your mikromedia board. Click the **Connect** button within 5s to enter the bootloader mode, otherwise existing microcontroller program will execute.

step 2 - Browsing for .HEX file



Figure 3-3: Browse for HEX

01 Click the **Browse for HEX** button and from a pop-up window (**Figure 3.4**) choose the .HEX file which will be uploaded to MCU memory.

step 3 - Selecting .HEX file

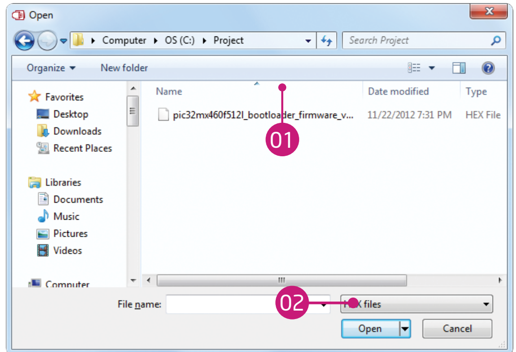


Figure 3-4: Selecting HEX

01 Select .HEX file using open dialog window.

02 Click the **Open** button.

step 4 – Uploading .HEX file



Figure 3-5: Begin uploading

01 To start .HEX file bootloading click the **Begin uploading** button.



Figure 3-6: Progress bar

01 Progress bar enables you to monitor .HEX file uploading.

step 5 - Finish upload



Figure 3-7: Restarting MCU

01 Click **OK** button after the uploading process is finished

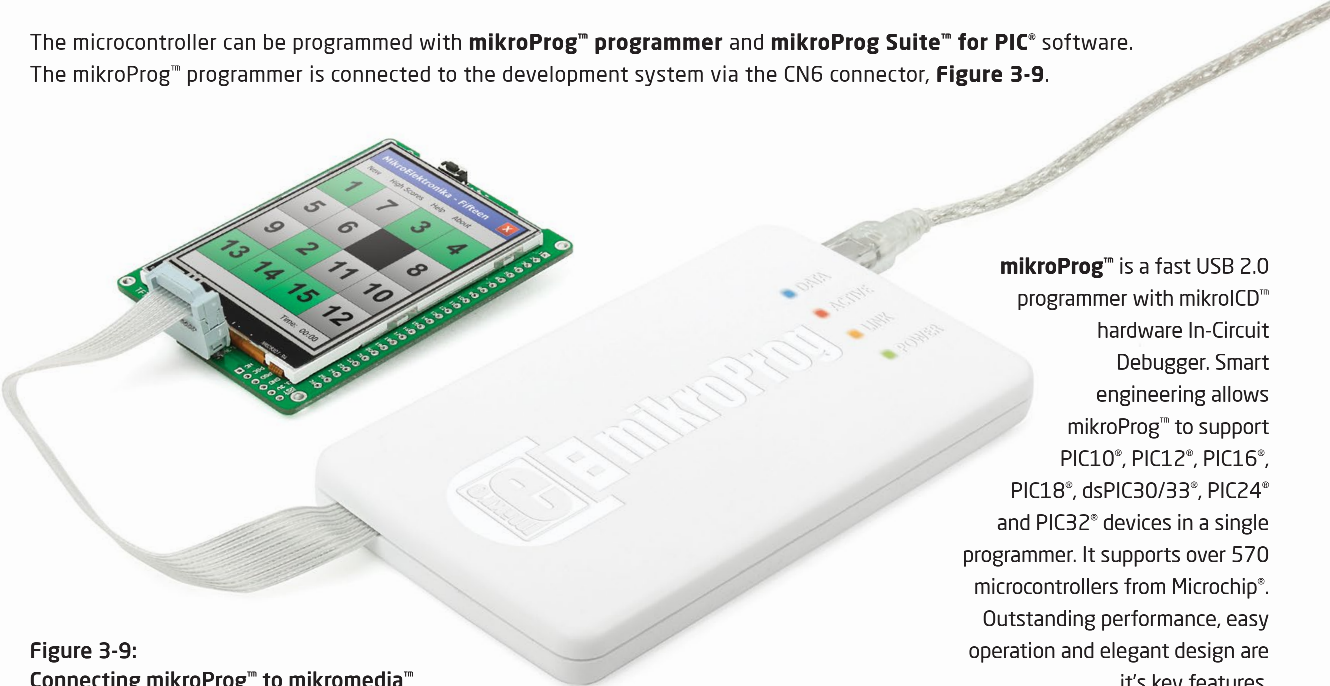
02 Press **Reset** button on mikromedia board and wait for 5 seconds. Your program will run automatically



Figure 3-8: mikroBootloader ready for next job

Programming with mikroProg™ programmer

The microcontroller can be programmed with **mikroProg™ programmer** and **mikroProg Suite™ for PIC®** software. The mikroProg™ programmer is connected to the development system via the CN6 connector, **Figure 3-9**.



mikroProg™ is a fast USB 2.0 programmer with mikroICD™ hardware In-Circuit Debugger. Smart engineering allows mikroProg™ to support PIC10®, PIC12®, PIC16®, PIC18®, dsPIC30/33®, PIC24® and PIC32® devices in a single programmer. It supports over 570 microcontrollers from Microchip®. Outstanding performance, easy operation and elegant design are it's key features.

Figure 3-9:
Connecting mikroProg™ to mikromedia™

mikroProg Suite™ for PIC® software

mikroProg™ programmer requires special programming software called **mikroProg Suite™ for PIC®**. This software is used for programming of ALL Microchip® microcontroller families, including PIC10®, PIC12®, PIC16®, PIC18®, dsPIC30/33®, PIC24® and PIC32®. Software has intuitive interface and SingleClick™ programming technology. Just by downloading the latest version of **mikroProg Suite**™ your programmer is ready to program new devices. **mikroProg Suite**™ is updated regularly, at least four times a year, so your programmer will be more and more powerful with each new release.

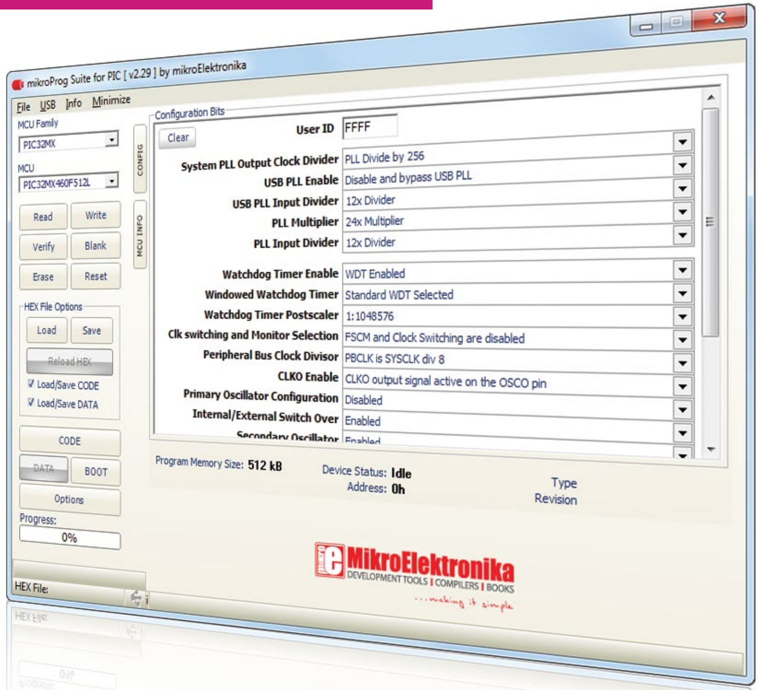


Figure 3-10: Main window of mikroProg Suite™ for PIC® programming software

Programming with ICD2® or ICD3® programmer

The microcontroller can be also programmed with **ICD2® or ICD3® programmer**. These programmers connects with mikromedia board via **ICD2 CONNECTOR BOARD.**

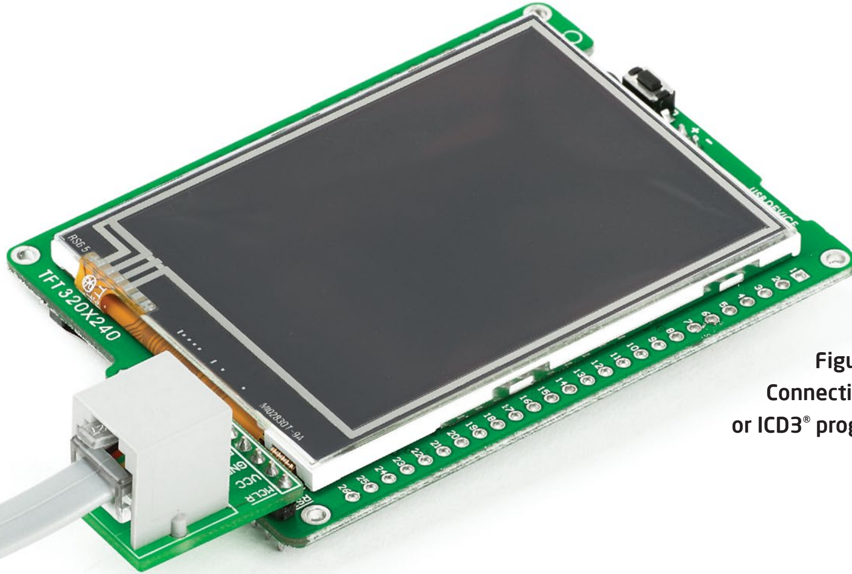


Figure 3-12: Connecting ICD2® or ICD3® programmer

In order to enable the ICD2® and ICD3® programmers to be connected to the mikromedia board, it is necessary to provide the appropriate connector such as the **ICD2 CONNECTOR BOARD**. This connector should be first soldered on the CN5 connector. Then you should plug the ICD2® or ICD3® programmer into it, **Figure 3-11**.

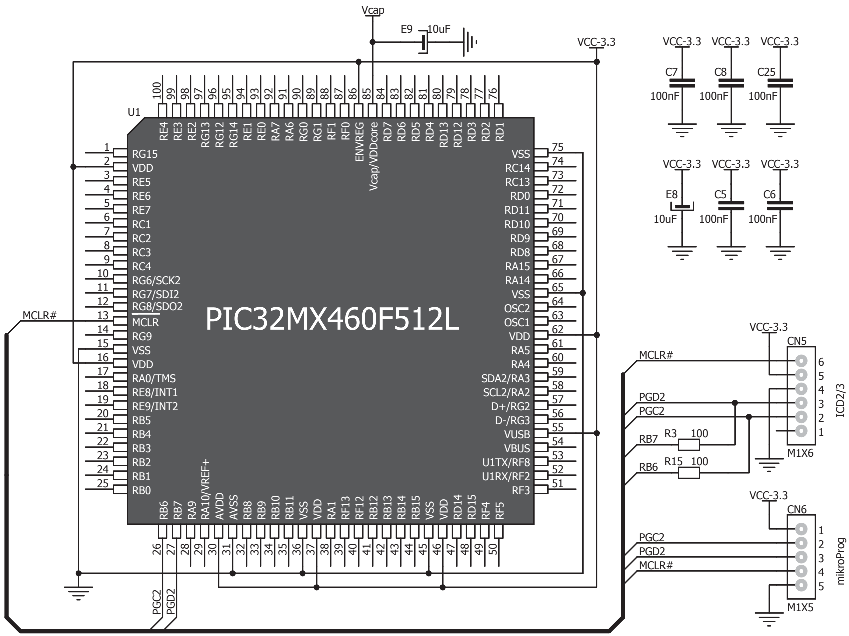


Figure 3-13: mikroProg™ & ICD2 / ICD3 programmer connection schematic

4. Reset button

Board is equipped with reset button, which is located at the top of the front side (**Figure 4-2**). If you want to reset the circuit, press the reset button. It will generate low voltage level on microcontroller reset pin (input). In addition, a reset can be externally provided through **pin 27** on side headers (**Figure 4-3**).

NOTE *You can also solder additional reset button on the appropriate place at the back side of the board,* ***Figure 4-1****.*

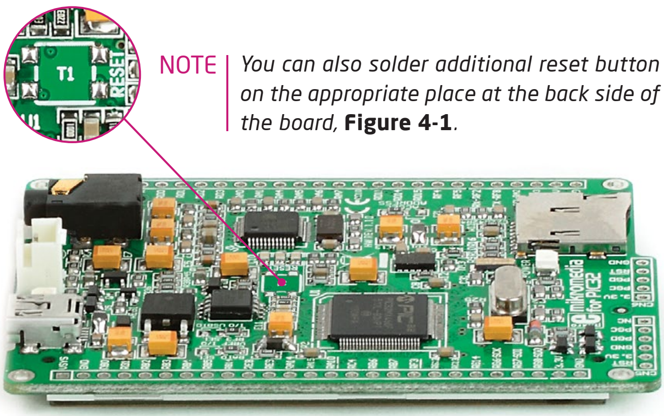


Figure 4-1: Location of additional reset button

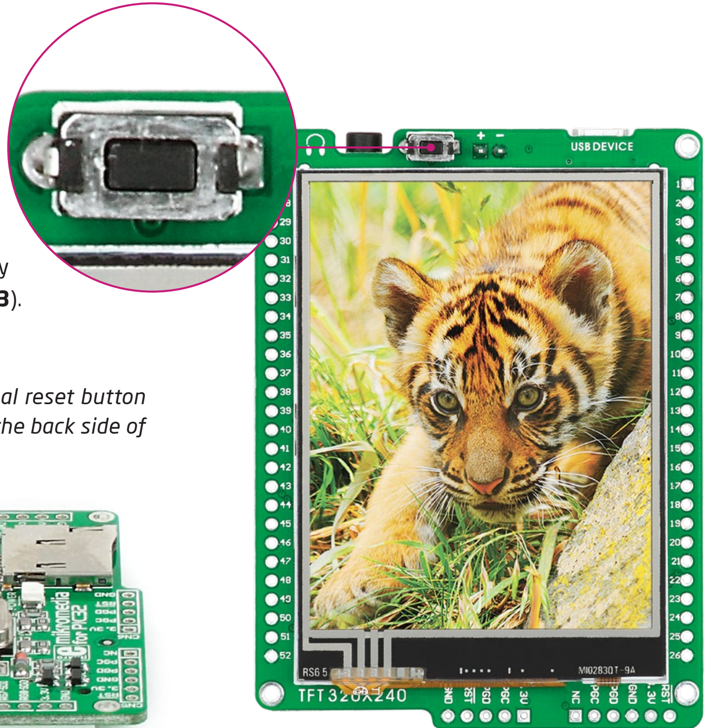


Figure 4-2: Frontal reset button

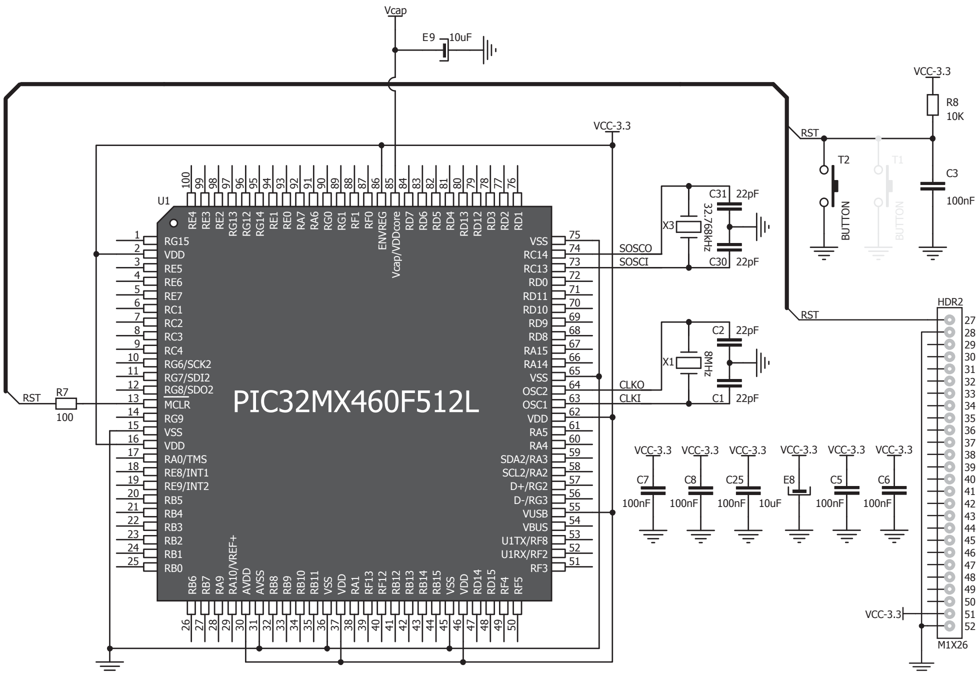
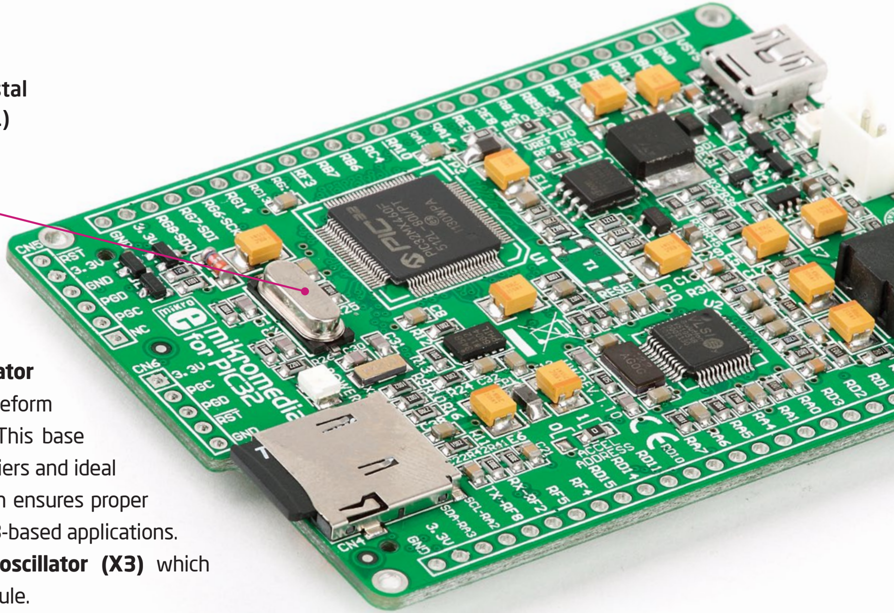


Figure 4-3: Reset circuit schematic

5. Crystal oscillator



Figure 5-1:
External crystal
oscillator (X1)



Board is equipped with **8MHz crystal oscillator (X1)** circuit that provides external clock waveform to the microcontroller CLKO and CLKI pins. This base frequency is suitable for further clock multipliers and ideal for generation of necessary USB clock, which ensures proper operation of bootloader and your custom USB-based applications. Board also contains **32.768kHz Crystal oscillator (X3)** which provides external clock for internal **RTCC** module.

NOTE | *The use of crystal in all other schematics is implied even if it is purposely left out because of the schematics clarity.*

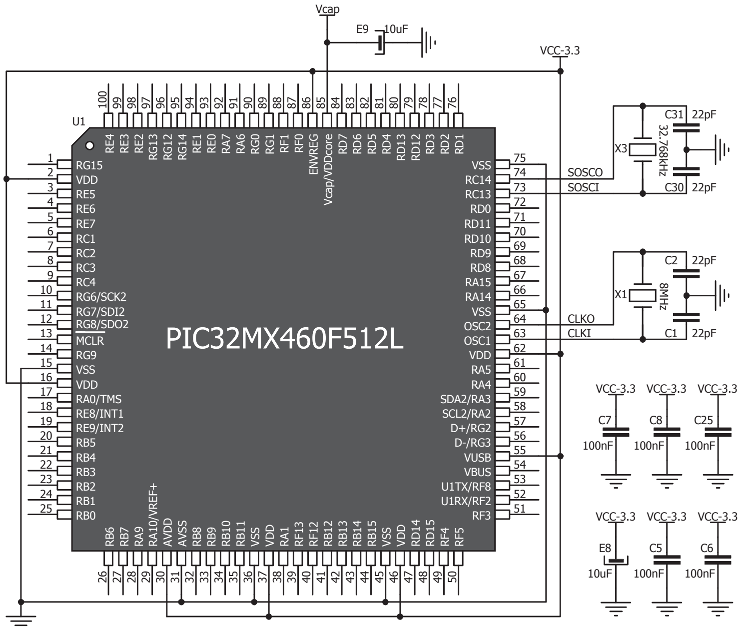


Figure 5-2: Crystal oscillator schematic

6. microSD card slot

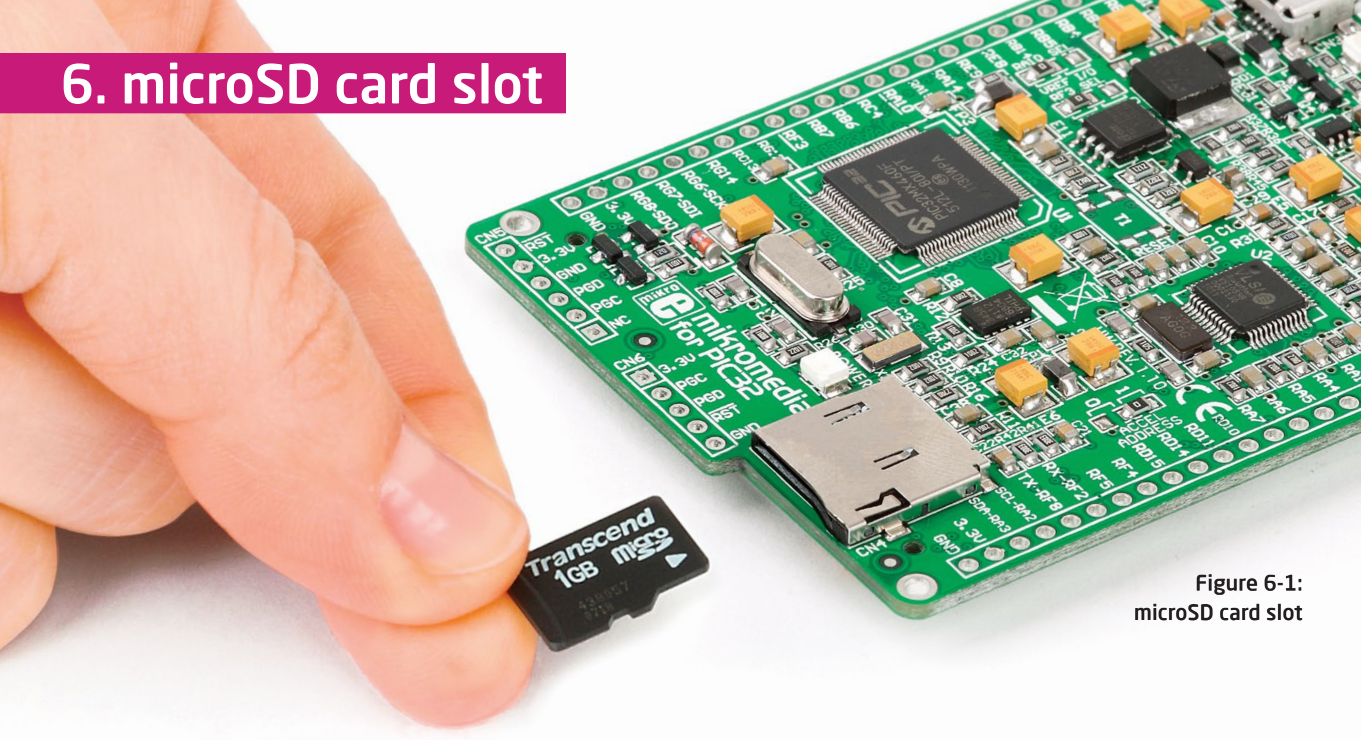


Figure 6-1:
microSD card slot

Board contains **microSD card slot** for using microSD cards in your projects. It enables you to store large amounts of data externally, thus saving microcontroller memory. microSD cards use Serial Peripheral Interface **(SPI)** for communication with the microcontroller.

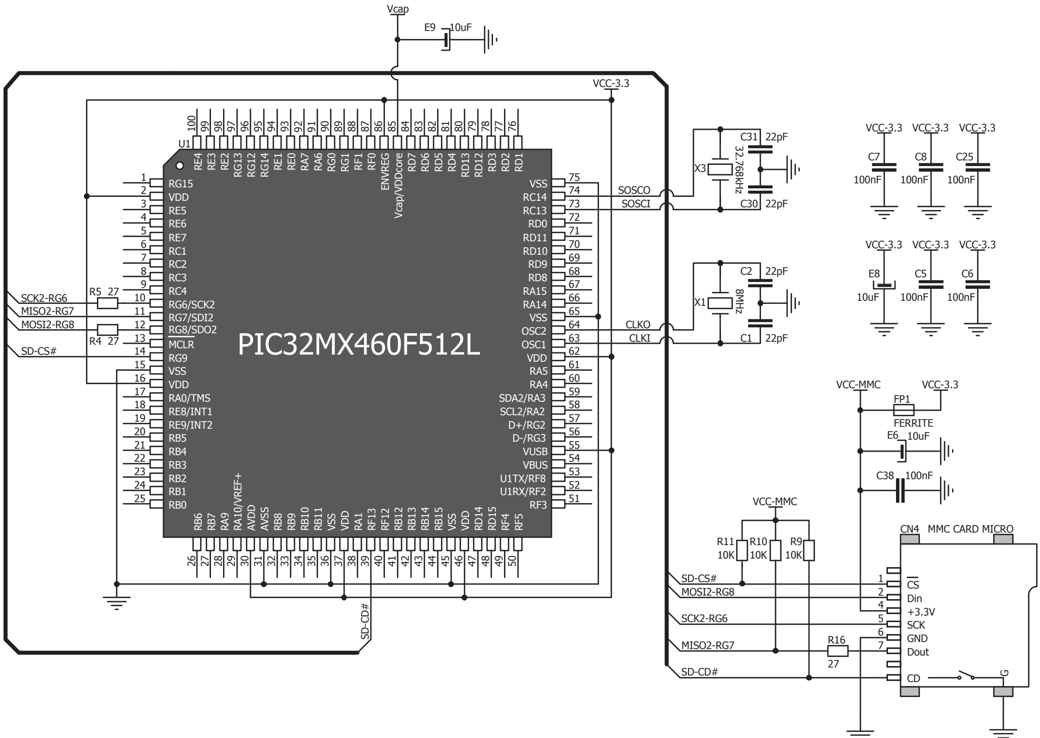


Figure 6-2: microSD Card Slot module connection schematic

7. Touch screen

The development system features a **TFT 320x240 display** covered with a **resistive** touch panel. Together they form a functional unit called a **touch screen.** It enables data to be entered and displayed at the same time. The TFT display is capable of showing graphics in **262.144** different **colors**.



Figure 7-1: Touch Screen

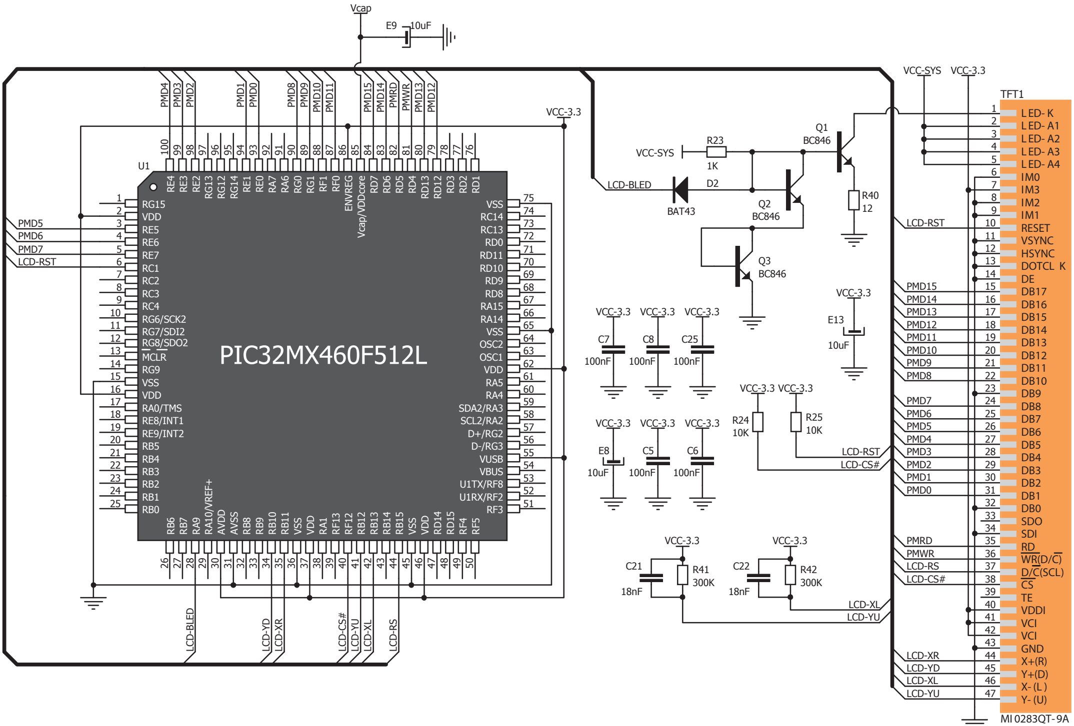


Figure 7-2: Touch Screen connection schematic

8. Audio module

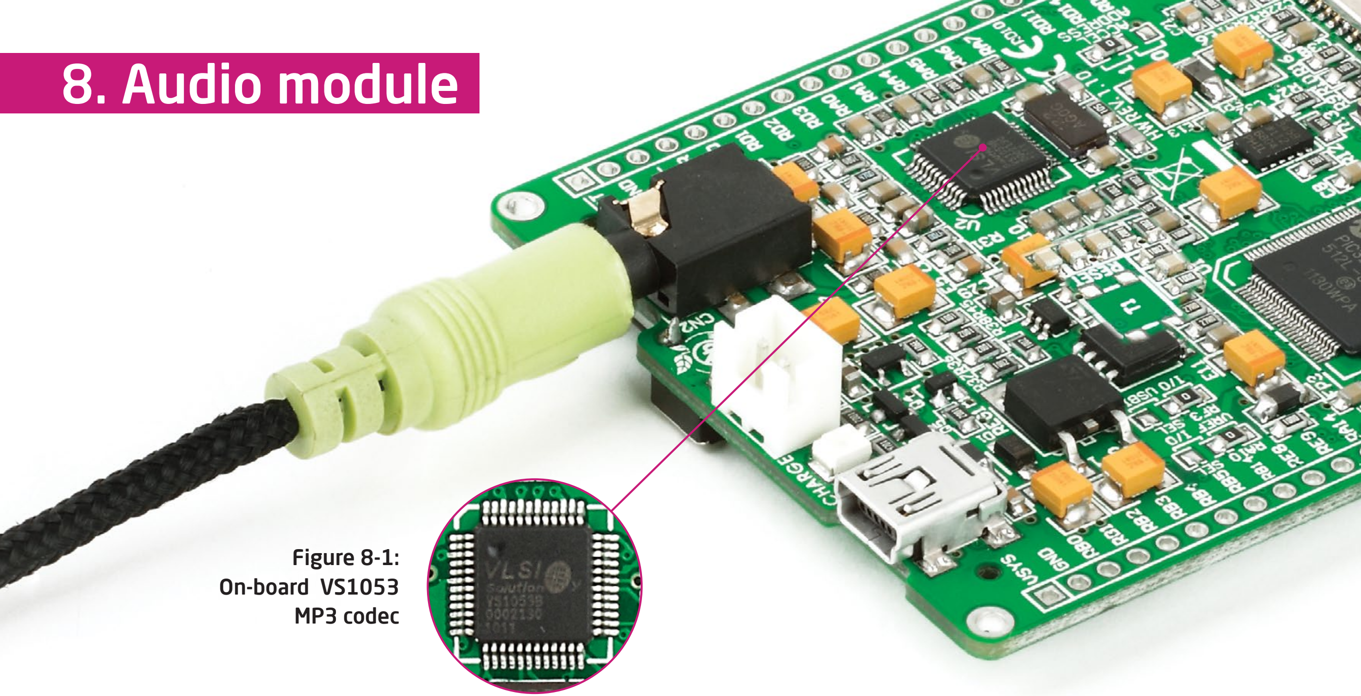


Figure 8-1: On-board VS1053 MP3 codec

The mikromedia for PIC32® features stereo audio codec **VS1053**. This module enables audio reproduction by using stereo headphones connected to the system via a **3.5mm** connector CN2. All functions of this module are controlled by the microcontroller over Serial Peripheral Interface **(SPI)**.

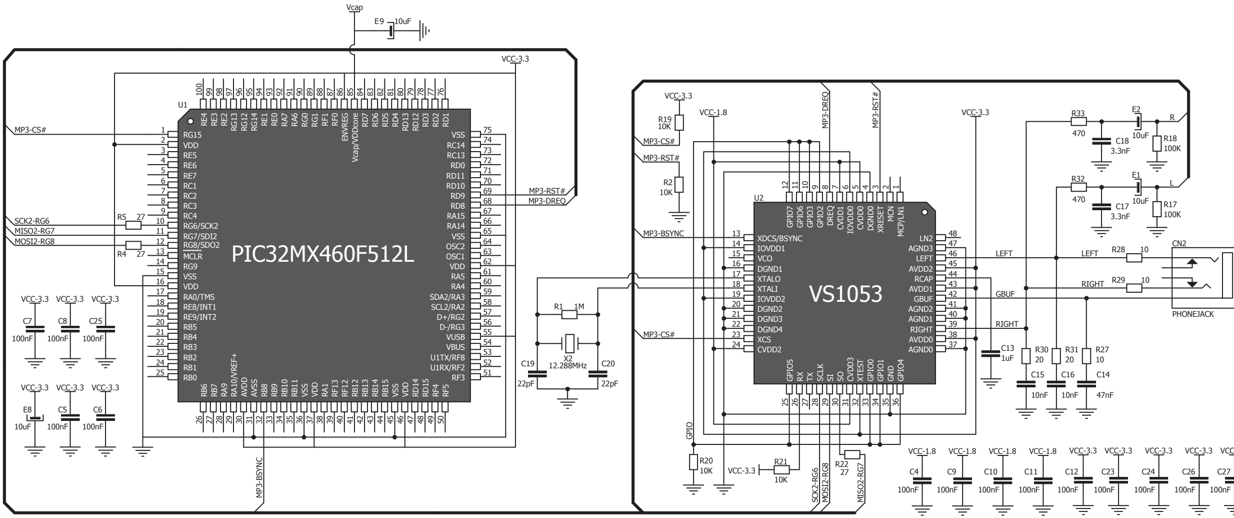


Figure 8-3: Audio module connection schematic

9. USB connection



Figure 9-1: Connecting USB cable to MINI-B USB connector

PIC32MX460F512L microcontroller has integrated USB module, which enables you to implement USB communication functionality to your mikromedia board. Connection with target USB host is done over MINI-B USB connector which is positioned next to the battery connector.

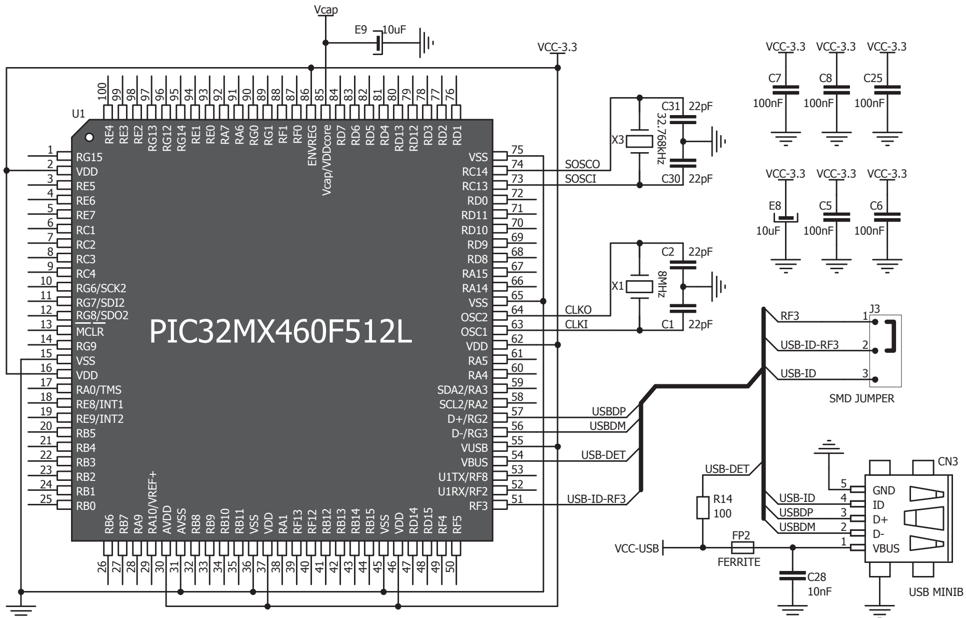


Figure 9-2: USB module connection schematic

10. Accelerometer

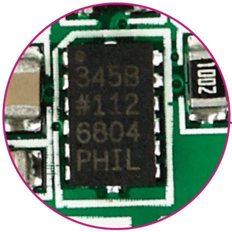
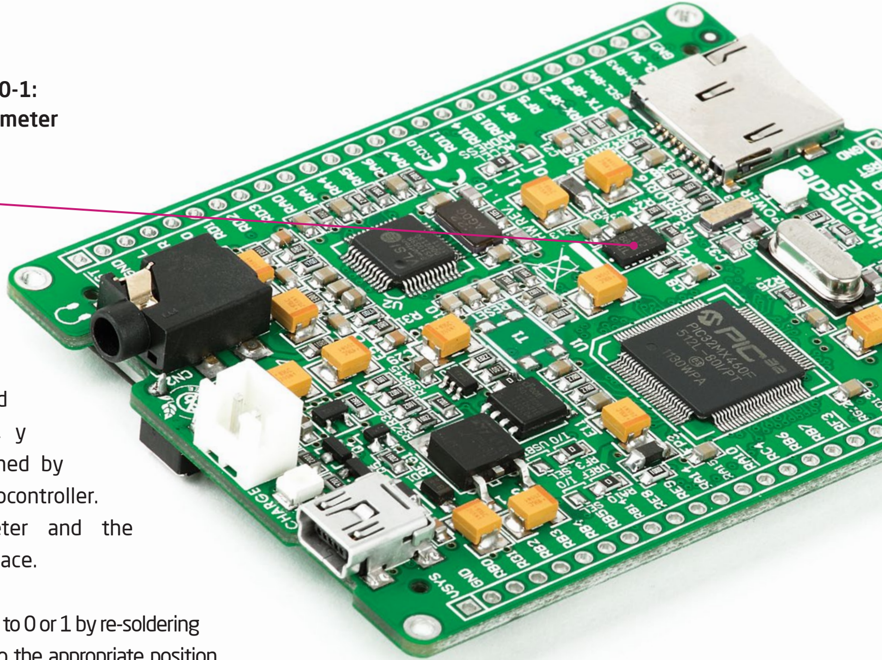
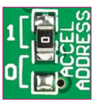


Figure 10-1: Accelerometer module



On board **ADXL345** accelerometer is used to measure acceleration in three axis: x, y and z. The accelerometer function is defined by the user in the program loaded into the microcontroller. Communication between the accelerometer and the microcontroller is performed via the **I²C** interface.



You can set the accelerometer address to 0 or 1 by re-soldering the SMD jumper (zero-ohm resistor) to the appropriate position. Jumper is placed in address 1 position by default.

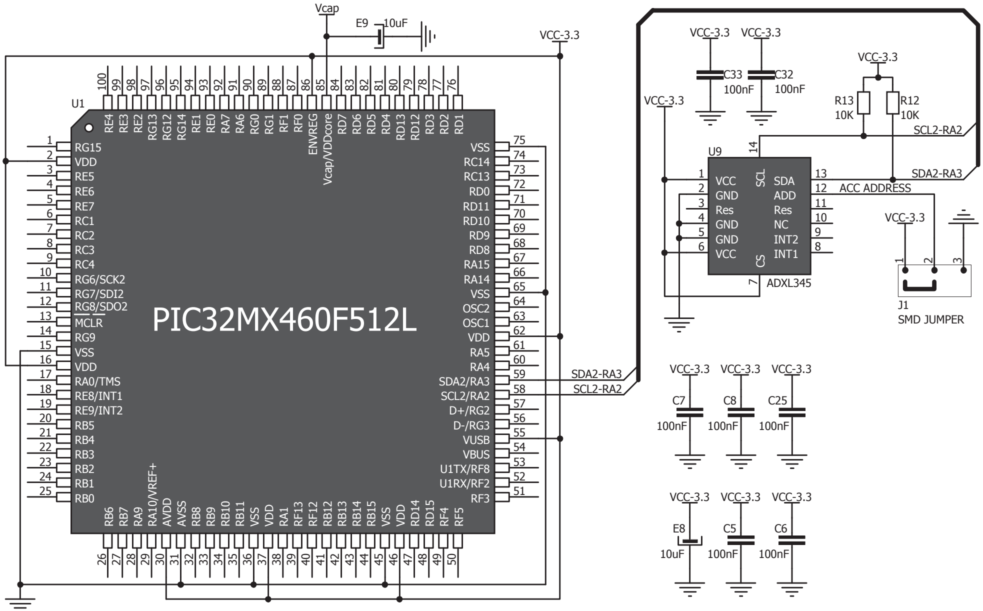


Figure 10-2: Accelerometer connection schematic

11. Flash memory



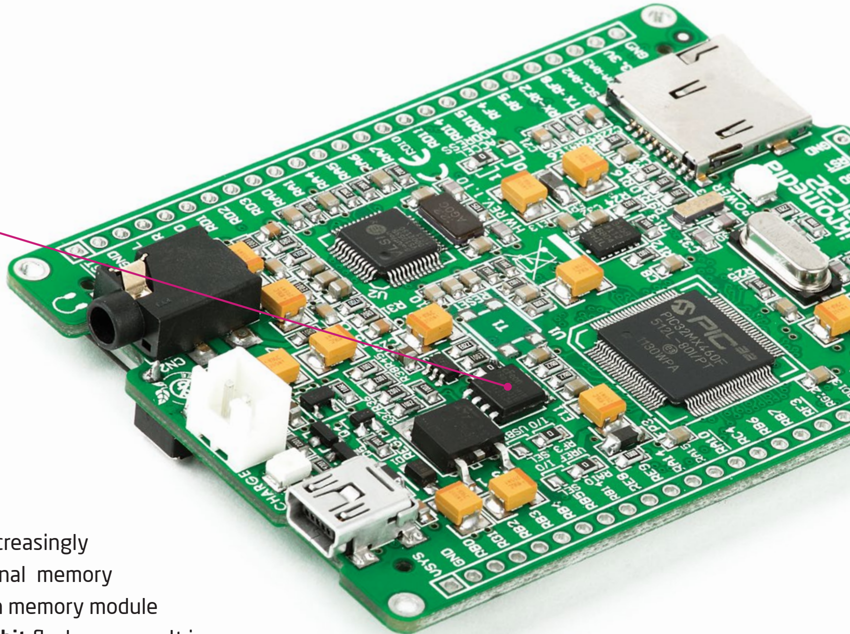


Figure 11-1:
Flash memory module

Since multimedia applications are getting increasingly demanding, it is necessary to provide additional memory space to be used for storing more data. The flash memory module enables the microcontroller to use additional **8Mbit** flash memory. It is connected to the microcontroller via the Serial Peripheral Interface **(SPI)**.

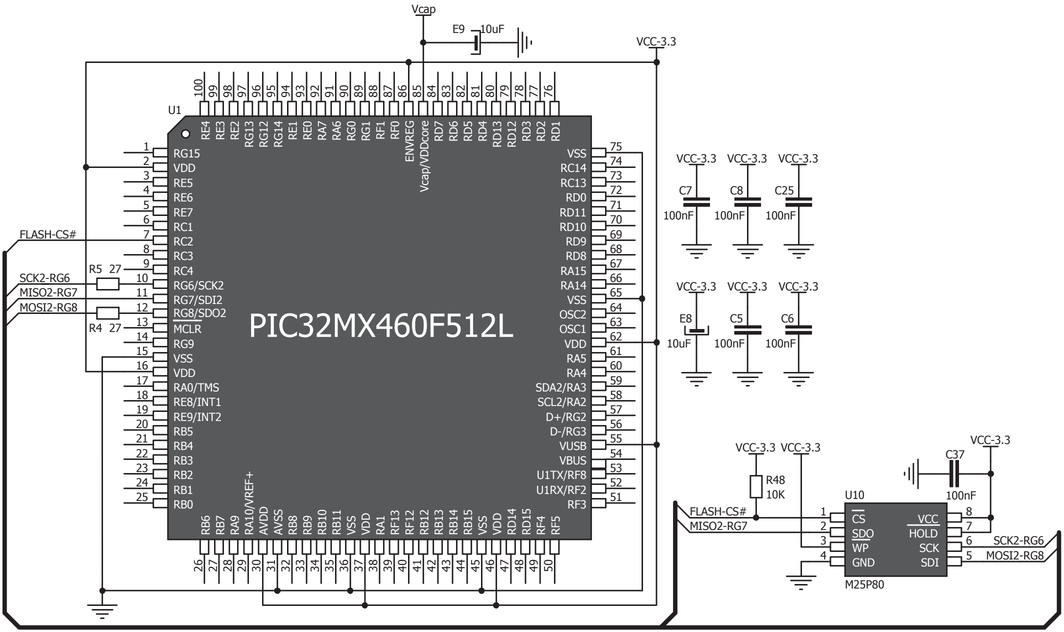
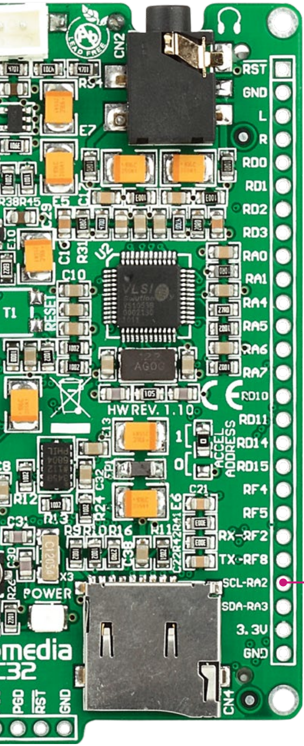


Figure 11-2: Flash memory module connection schematic

12. Pads

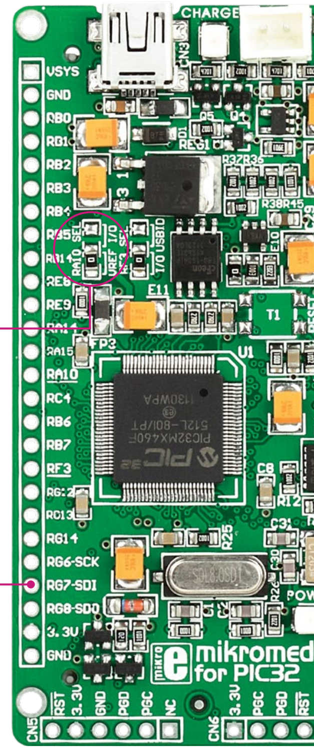


Most microcontroller pins are available for further connectivity via two 1x26 rows of connection pads on both sides of the mikromedia board. They are designed to match additional shields, such as Battery Boost shield, Gaming, PROTO shield and others.

Note: pin **RA10** can be used either as an I/O or as VREF1.8. (to switch between those, solder jumper J2 in appropriate position).

Pads HDR2

Pads HDR1



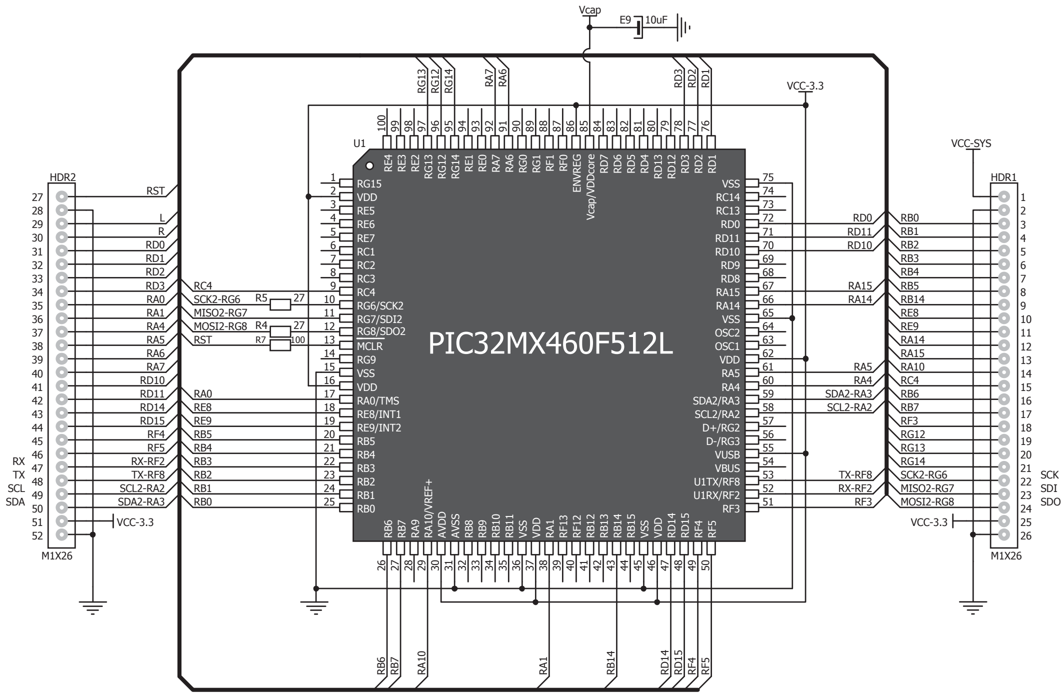
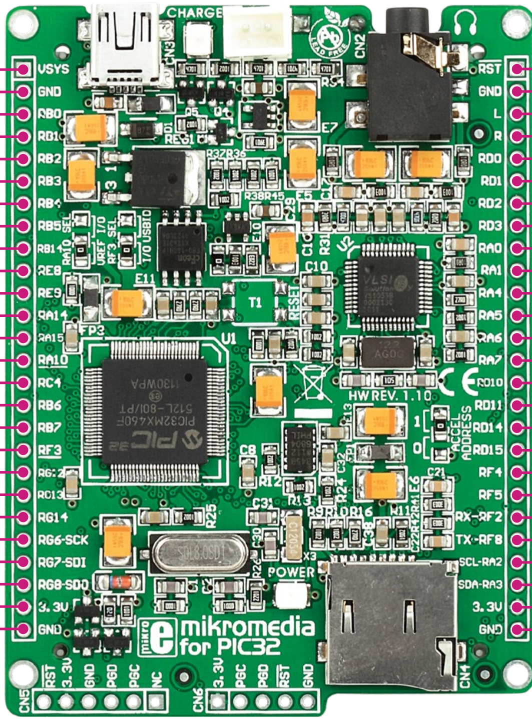


Figure 12-1: Connection pads schematic

13. Pinout

Pin functions (left side)

Function	Pin
5V power supply	VSYS
	GND
Analog Lines	RB0
	RB1
	RB2
	RB3
	RB4
	RB5
	RB14
Interrupt Lines	RE8
	RE9
	RA14
	RA15
Digital I/O lines	RA10
	RC4
	RB6
	RB7
	RF3
	RG12
	RG13
	RG14
SPI2 SCK2	RG6
SPI2 SDI2	RG7
SPI2 SDO2	RG8
3.3V power supply	3.3V
Reference Ground	GND

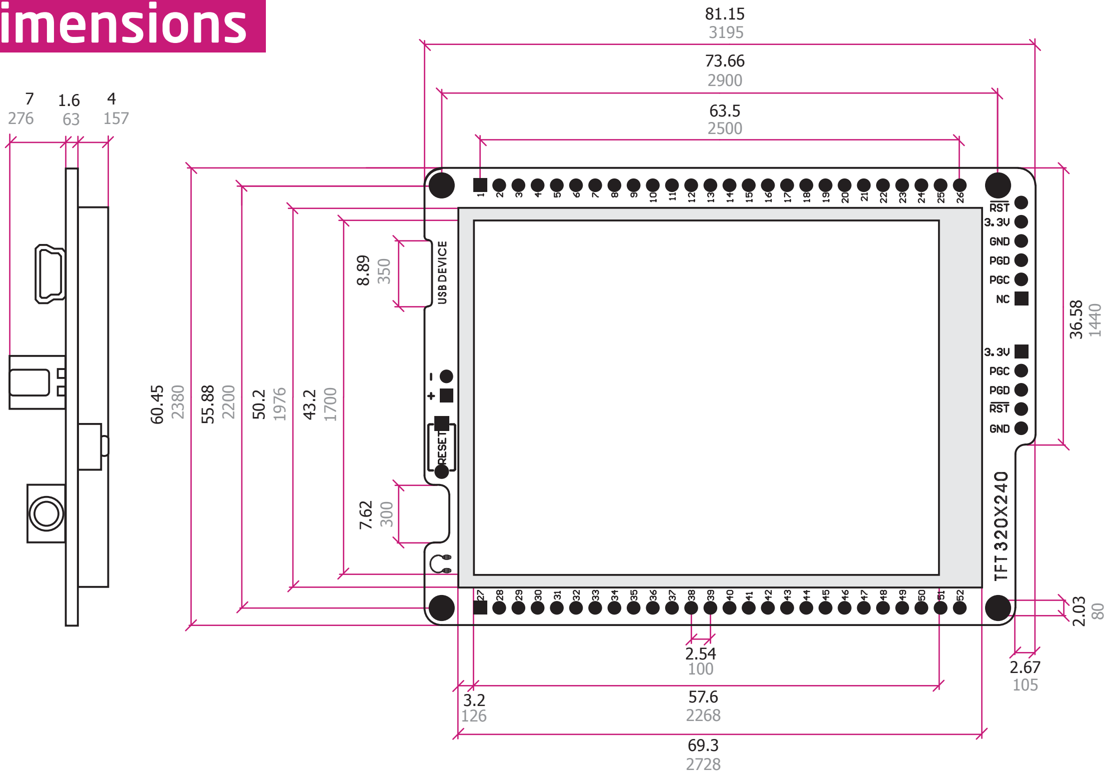


Pin functions (right side)

Pin	Function
RST	Reset pin
GND	Reference Ground
L	left ch. (audio out)
R	right ch. (audio out)
RD0	PWM lines
RD1	
RD2	
RD3	
RA0	Digital I/O lines
RA1	
RA4	
RA5	
RA6	
RA7	
RD10	
RD11	
RD14	
RD15	
RF4	
RF5	
RF2	RX (UART)
RF8	TX (UART)
RA2	SCL2 (I²C)
RA3	SDA2 (I²C)
3.3V	3.3V power supply
GND	Reference Ground

Digital lines | Analog Lines | Interrupt Lines | SPI Lines | I2C Lines | UART lines | PWM lines

14. Dimensions



Legend

mm

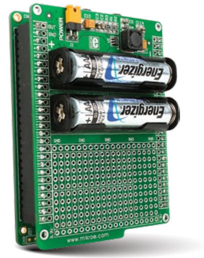
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15. mikromedia accessories

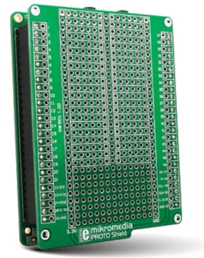
We have prepared a set of extension boards pin-compatible with your mikromedia, which enable you to easily expand your board's basic functionality. We call them mikromedia shields. But we also offer other accessories, such as Li-polymer battery, stacking headers, wire jumpers and more.



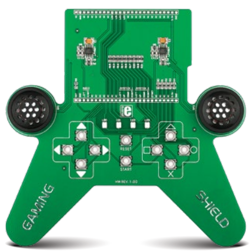
01 Connect shield



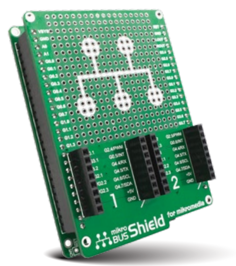
02 BatteryBoost shield



03 PROTO shield



04 Gaming shield



05 mikroBUS™ shield



06 Li-Polimer battery



07 Wire jumpers

What's next?

You have now completed the journey through each and every feature of mikromedia for PIC32 board. You got to know its modules and organization. Now you are ready to start using your new board. We are suggesting several steps which are probably the best way to begin. Find useful projects and tutorials on the **Libstock** website (*www.libstock.com*). Join our **Forum** (*www.mikroe.com/forum*) and get help from a large ecosystem of users.

Compiler



You still don't have an appropriate compiler? Locate PIC32® compiler that suits you best on our site:

www.mikroe.com/pic/compilers

Choose between mikroC™, mikroBasic™ and mikroPascal™ and download a fully functional demo version, so you can begin building your first applications.



Visual TFT

Once you have chosen your compiler, and since you already got the board, you are ready to start writing your first projects. **Visual TFT software** enables you to quickly create your GUI. It will automatically generate code compatible with MikroElektronika compilers. Visual TFT is rich with examples, which are an excellent starting point for your future projects. Download it from the link bellow:

www.mikroe.com/visualtft

Notes:

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